BEFORE THE
PUBLIC UTILITIES COMMISSION
OF THE
STATE OF CALIFORNIA

Order Instituting Rulemaking Regarding Policies, Procedures and Rules for the California Solar Initiative, the Self-Generation Incentive Program and Other Distributed Generation Issues	)))))	Rulemaking 06-03-004 (Filed March 2, 2006)

Reply Comments of R. Thomas Beach /Crossborder Energy on the Staff's Proposed Program for the California Solar Initiative

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Pursuant to the Rulings of Administrative Law Judge Dorothy Duda dated April 25 and May 9, 2006, R. Thomas Beach respectfully files these reply comments on the proposal by the Commission's Energy Division (the Staff Proposal) on performance-based incentives and other program elements for the California Solar Initiative (CSI).[1] I file these comments as the owner and operator of a 2.4 kW photovoltaic (PV) system on my family's home in Kensington, California, and as an active participant in a wide range of Commission proceedings on avoided costs, renewable energy, and distributed generation.

My opening comments focused on the "Design Factor" that the Staff Proposal would include in the formula for the Expected Performance Based Buydown (EPBB) incentive for small PV systems (less than 100 kW). On other issues concerning the design of the CSI, I generally support the proposals of the Joint Solar Parties,[2] and have joined the reply comments of the Joint Solar Parties on those issues. In particular, I believe that the Joint Solar Parties' volume-based trigger mechanism for CSI incentives provides the most reasonable means to ensure consistent support for solar technologies and to reach the CSI's ambitious goals.

[1] Hereafter, the "Staff Proposal."

[2] The Joint Solar Parties include PV Now, Vote Solar, and the California Solar Energy Industries Association (CalSEIA).

With respect to the specific issue addressed in my opening comments, my principal concern with the staff's Design Factor is that it fails to reflect the fact that west-facing PV systems produce more valuable power than south-facing systems, because west-facing arrays produce a much larger percentage of their energy during the typical utility's summer on-peak period of noon to 6 p.m. In fact, the research and calculations presented in my opening comments show that the increased value of power production from west-facing PV systems largely or completely offset the lower annual average output from such systems, compared to a reference south-facing system.

The Design Factor received only modest attention in the opening comments of other parties.[3] However, several parties did agree that the higher value of power from west-facing systems should be recognized.[4] For example, Southern California Edison (Edison) suggested that systems oriented from south to southwest should receive the maximum incentive.[5]

I anticipate that most parties will agree with the concept that peak period (i.e. afternoon) production is most valuable and should be encouraged – particularly given that solar technologies are so well-suited to producing peak period power. The principal concern that I expect parties to express is the potential complexity of taking into account the time-varying value of electricity in the design of an incentive structure. I fully agree that the incentive structure for small customers should be simple and understandable. In my view, the Design Factor should be no more

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[3] The Joint Solar Parties propose to change the reference system in the Design Factor to a horizontal system, but this change is intended to offset a change in system ratings that, unless compensated through the Design Factor, would reduce the effective level of EPBB incentives. The Americans for Solar Power (ASPv), at page 14, propose that the Design Factor use a reference system with a tilt equal to the latitude of the designed system,as a means to reflect geography in the Design Factor.

[4] *See* Opening Comments of Michael Kyes and of Southern California Edison. Edison also advocates the inclusion of a locational factor in the EPBB formula, to reward systems installed in sunnier locations.

[5] Edison Opening Comments, at 7.

complicated than a simple table that allows the customer to look up the Design Factor, given the azimuth and tilt of the proposed system.[6] For the Commission's convenience, I have constructed such tables for several candidate Design Factors. All of these tables were constructed using the PVWATTS calculator for a system sited in Fresno.

Table 1 shows the staff's proposed Design Factor, which is the ratio of the annual output of the design system to the annual output of the reference south-facing system at a 30° tilt. The staff's Design Factor is less than or equal to 1.0 for all systems. West-facing systems at a 30° tilt will receive incentives that are 17% lower than the reference system (i.e. a Design Factor of 0.83), even though the total value of the output from such a west-facing system is similar to the value of production from the reference system.

Some parties may comment that west-facing systems can compensate for a lower incentive, because they can take better advantage of the utilities' time-of-use rate tariffs. For a west-facing system at a 30° tilt, this would require the time-of-use benefits to offset <u>both</u> the lower incentive resulting from a 0.83 Design Factor <u>and</u> the 17% lower annual output of such a system. As shown in Table 1 of my opening comments, the PG&E E-6 and E-7 time-of-use rates provide west-facing systems with per unit rate benefits that are 9% to 17% higher, respectively, than south-facing systems. These benefits at least partially offset the lower annual production of west-facing systems, but will not also compensate for the lower incentive payments that would result from the staff's Design Factor. For this reason, I continue to recommend that the Design Factor should not penalize west-facing systems in comparison to south-facing systems.

Table 2 illustrates how west-facing systems shift output into the afternoon on-peak period. The Design Factor in Table 2 is the ratio of summer (May - October) on-peak (noon- 6 p.m.) output from the design system to summer on-peak output from the reference system (south-

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[6] There should also be a simple adjustment for shading.

Table 1

CPUC Staff Proposed Design Factors

Ratio of Designed Annual Output to Annual Output of South-Facing System at a 30 Degree Tilt

			Tilt Horizontal	10	20	30	40
Azimuth	135	SE	0.89	0.93	0.96	0.95	0.93
	150		0.89	0.95	0.97	0.98	0.96
	165		0.89	0.95	0.99	1.00	0.98
	180	South	0.89	0.95	0.99	**1.00**	0.98
	195		0.89	0.95	0.99	1.00	0.98
	210		0.89	0.94	0.97	0.98	0.96
	225	SW	0.89	0.93	0.95	0.95	0.93
	240		0.89	0.92	0.93	0.92	0.89
	255		0.89	0.90	0.90	0.88	0.84
	270	West	0.89	0.89	0.86	0.83	0.78
	285		0.89	0.87	0.83	0.78	0.72
	300		0.89	0.85	0.79	0.72	0.65
	315	NW	0.89	0.84	0.76	0.67	0.58

Notes:
1. *Reference system is in* ***bold*** *.*
2. *Design factors calculated using PVWATTS calculator for Fresno.*
3. *Table assumes no shading.*

Table 2

Summer On-Peak Design Factors

Ratio of Designed Summer (May-October) On-Peak (Noon-6 p.m.) Output to Summer On-Peak Output of Reference System

			Tilt				
			Horizontal	10	20	30	40
Azimuth	135	SE	0.97	0.89	0.81	0.71	0.61
	150		0.97	0.93	0.87	0.80	0.71
	165		0.97	0.97	0.94	0.90	0.84
	180	South	0.97	1.00	1.02	**1.00**	0.96
	195		0.97	1.04	1.08	1.10	1.09
	210		0.97	1.07	1.13	1.17	1.19
	225	SW	0.97	1.09	1.17	1.23	1.25
	240		0.97	1.10	1.20	1.26	1.29
	255		0.97	1.10	1.20	1.27	1.30
	270	West	0.97	1.09	1.19	1.25	1.27
	285		0.97	1.08	1.15	1.20	1.21
	300		0.97	1.05	1.11	1.13	1.13
	315	NW	0.97	1.02	1.05	1.05	1.01

Notes:
1. *Reference system is in* ***bold*** *.*
2. *Design factors calculated using PVWATTS calculator for Fresno.*
3. *Table assumes no shading.*

facing, 30° tilt). The table shows that a west-facing system at a 30° tilt produces 25% more summer on-peak power than does the reference system.

Table 3 is the Design Factor that I proposed in my opening comments. For systems that face any direction from south to west, my proposed Design Factor is:

Design Factor = Minimum Simulated <u>Summer</u> Output for Designed System / Simulated <u>Summer</u> Output for Fixed 30° Tilt <u>At Same Azimuth Angle</u> Without Shading

For the systems with azimuths less than 180°, the reference system in the denominator of the Design Factor is a system with a 30° tilt facing south; for azimuths greater than 270°, the reference is a system with a 30° tilt facing west. The horizontal Design Factor is calculated in reference to a system with a 30° tilt facing southwest. These Design Factors do not penalize systems with azimuths between 180° and 270° and provide a modest incentive for low tilt angles that emphasize summer production. The Design Factor does fall below 1.0 for systems that are not oriented between south and west, or for systems with large tilt angles.

Other Design Factors that recognize the value of on-peak production also are possible. Another option for the Design Factor would be the product of the staff's Table 1 Design Factor (which emphasizes annual production) and the Table 2 Design Factor based on summer on-peak output (which recognizes the higher value of on-peak production). This hybrid Design Factor is shown in **Table 4**. This Design Factor would provide the largest incentive for systems that face southwest, as Edison has suggested.

I would be happy to provide the Commission or the Energy Division with the workpapers for these tables.

<u>Table 3</u>

Crossborder Proposed Design Factors

Ratio of Designed Summer (May - October) Output
to Summer Output of Reference System at the Same Azimuth Angle

			Tilt				
			Horizontal	10	20	30	40
Azimuth	135	SE	1.00	0.99	1.00	0.98	0.95
	150		1.00	1.00	1.01	0.99	0.96
	165		1.00	1.00	1.01	1.00	0.97
	180	South	1.00	1.00	1.02	**1.00**	0.96
	195		1.00	1.00	1.01	**1.00**	0.97
	210		1.00	1.01	1.01	**1.00**	0.96
	225	SW	1.00	1.02	1.02	**1.00**	0.96
	240		1.00	1.03	1.03	**1.00**	0.96
	255		1.00	1.05	1.03	**1.00**	0.95
	270	West	1.00	1.08	1.05	**1.00**	0.94
	285		1.00	1.06	1.02	0.96	0.89
	300		1.00	1.05	0.99	0.91	0.83
	315	NW	1.00	1.04	0.97	0.88	0.77

Notes:

1. *Reference systems are in* ***bold*** *.*
2. *Design factors calculated using PVWATTS calculator for Fresno.*
3. *For azimuths less than 180 degrees, reference system is the south-facing system.*
4. *For azimuths greater than 270 degrees, reference system is the west-facing system.*
5. *The reference for the horizontal system is a southwest system at a 30 degree tilt.*
6. *Table assumes no shading.*

Table 4

Alternative Design Factor
Combination of Annual and Summer On-Peak Design Factors

			Tilt Horizontal	10	20	30	40
Azimuth	135	SE	0.86	0.83	0.77	0.68	0.57
	150		0.86	0.88	0.85	0.79	0.69
	165		0.86	0.92	0.93	0.89	0.83
	180	South	0.86	0.96	1.01	**1.00**	0.94
	195		0.86	0.99	1.07	1.09	1.07
	210		0.86	1.01	1.10	1.15	1.14
	225	SW	0.86	1.01	1.12	1.17	1.17
	240		0.86	1.01	1.11	1.16	1.15
	255		0.86	0.99	1.08	1.11	1.09
	270	West	0.86	0.97	1.02	1.03	1.00
	285		0.86	0.93	0.95	0.93	0.87
	300		0.86	0.90	0.88	0.82	0.73
	315	NW	0.86	0.85	0.80	0.70	0.59

Notes:
1. *Reference system is in* ***bold****.*
2. *Design factors calculated using PVWATTS calculator for Fresno.*
3. *Table assumes no shading.*

I thank the Commission for the opportunity to present these comments on the design of the CSI program.

Respectfully submitted,

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